

# BACKLIGHT UNIT STRUCTURE FOR LIQUID CRYSTAL DISPLAY

## BACKGROUND OF THE INVENTION

### 5 Field of the invention

The present invention relates to a backlight unit for a liquid crystal display (LCD), and more particularly to a backlight unit structure for a liquid crystal display having a blink backlight structure provided with a reflection plate  
10 to allow for improvement of a response time and accomplishment of a high luminance.

### Description of the Prior Art

In order to improve a response time in an LCD, a  
15 technique using a high-speed response liquid crystal has been employed in general. Further, this response time may be more improved by panel structures, such as a VA (Vertical Alignment) panel structure, an IPS (In Plane Switch) panel structure, an OCB (Optically Compensated Bend) panel  
20 structure and so forth, rather than by a typical TN (Twisted Nematic) panel structure. The response time may be also improved by a driving method such as a CCD driving method, other than these panel structures.

Even though the above-mentioned various techniques have

been used to improve the response time, it has been impossible to acquire the same response time as a CRT (Cathode Ray Tube).

This results from a display principle of the CRT, which  
5 is based on an impulse light emission system. That is, the CRT is displayed by emitting light once (2-3 ms) a frame (16.7 ms, 60 Hz).

However, because the LCD emits light in succession (16.7 ms) during one frame, a blur phenomenon is generated while  
10 the LCD is displayed, unlike the CRT. In particular, in the case of a moving picture, a serious mismatch phenomenon wherein image signals are mismatched with the eyes of a user is generated from the LCD. This mismatch phenomenon is a common phenomenon found not only in an LCD but also in  
15 display devices using a method of steadily emitting light, such as a plasma display panel (PDP) and an electroluminescence (EL) display.

As shown in FIGs. 1a and 1b, an impulse system is realized by providing a plurality of module backlights 11  
20 under a display panel 15, and then by performing a sequential turning on/off according to a principle similar to that in a CRT display.

Here, to obtain a satisfactory display image quality, the sequential turning on/off is synchronized with a gate

signal at the same time. In other words, as in FIG. 2, the backlights 11 located under a gate line become on-state when the gate signal is applied to the gate line, while the backlights 11 become off-state when the gate signal is not  
5 applied to the gate line. That is, the on-state of the backlights 11 is gradually shifted from the upper side of the display to the lower side thereof.

According to research data of Hitachi Inc., when the sequential turning on/off mode is used in a blink backlight  
10 system having six lamps, a luminance is reduced at 16% compared with a system in which the lamps are continuously turned on. When a duty time of the lamp is set to 60%, luminance of 60% can be obtained.

As the duty time becomes shorter, a trade-off  
15 relationship ensues, in which a moving picture becomes clearer but the luminance becomes reduced. The research data of Hitachi Ltd. reports that a minimum duty time for reducing the blur phenomenon in a moving picture of an LCD is 70%.

20 Further, as a tube current of a typical luminous body (CFL (Color Cathode Fluorescent Lamp)) is growing high, a temperature of the lamp is increased, and thus an efficiency of the luminance is decreased.

In the blink backlight system, because the off-state of

the lamp prevents the temperature of the lamp from increasing, there is a room to increase the tube current compared with the lamp in a steady on-state, so that the luminance can be increased.

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#### SUMMARY OF THE INVENTION

Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the prior art, and an object of the present invention is to provide a  
10 backlight unit structure for an LCD having a blink backlight structure mounted with a reflection plate, so as to improve a response time and to obtain a high luminance.

In order to accomplish this object, there is provided a  
15 backlight unit structure for an LCD (Liquid Crystal Display), comprising: a lamp disposed under a display panel; and a reflection plate rotatably disposed around the lamp and having an opening through which light can be concentrated on the display panel.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will be more apparent from the

following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1a is a top view of a blink backlight for an LCD according to the prior art;

5        FIG. 1b is a cross-sectional view taken along line Ib-Ib of FIG. 1a;

FIG. 2 is a schematic view for explaining a driving principle of a blink backlight for an LCD of FIG. 1;

10        FIG. 3a is a top view of a blink backlight having a reflection plate in accordance with the present invention;

FIG. 3b is a cross-sectional view taken along line IIIb-IIIb of FIG. 3a;

FIG. 3c is a magnified view of part A of FIG. 3b;

15        FIG. 4 shows variation in direction of light and display area depending on time, in a blink backlight structure for an LCD according to the present invention;

FIG. 5 is perspective view of a blink backlight having a reflection plate in accordance with one embodiment of the present invention; and

20        FIG. 6 is a cross-sectional view of a blink backlight having a reflection plate in accordance with another embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, a preferred embodiment of the present invention will be described with reference to the accompanying drawings. In the following description and  
5 drawings, the same reference numerals are used to designate the same or similar components, and so repetition of the description on the same or similar components will be omitted.

FIG. 3a is a top view of a blink backlight having a  
10 reflection plate in accordance with the present invention. FIG. 3b is a cross-sectional view taken along line IIIb-IIIb of FIG. 3a. FIG. 3c is a magnified view of part A of FIG. 3b.

FIG. 4 shows variation in the direction of light and display area depending on time, in a blink backlight  
15 structure for an LCD according to the present invention.

Further, FIG. 5 is perspective view of a blink backlight having a reflection plate in accordance with one embodiment of the present invention. FIG. 6 is a cross-sectional view of a blink backlight having a reflection plate in accordance  
20 with another embodiment of the present invention.

The present invention proposes a method capable of decreasing the duty time without sacrifice of luminance, in consideration of the fact that a clear moving picture may be obtained by decreasing a duty time in a blink backlight

system.

In a backlight unit structure according to the present invention has a structure, as shown in FIGs. 3A to 3C, a reflection plate 27 is spaced a predetermined distance apart  
5 from a backlight lamp 23, and then the backlight lamp 23 is turned by a rotation driver 31. Here, a reference numeral 29, not mentioned above, indicates a display area.

Further, the reflection plate 27 is formed integrally with the lamp 23 so that the reflection plate 27 can rotate  
10 together with the lamp 23. Further, the reflection plate 27 surrounding the backlight lamp 23 has a structure shaped like a partly broken cylinder, that is, has a sectional shape of a perforated circle having an opening through which light can be concentrated and collected on the display panel.

15 Further, it is important to harmonize a rotation speed of the backlight lamp 23 with a scanning speed of a gate signal. In other words, light of the backlight lamp is concentrated on a pixel synchronized with the signal.

Therefore, the method technically allows the duty time  
20 to reduce a scanning time of the gate signal in the blink backlight, so that it is possible to reduce a blur phenomenon of the moving picture and to maximize an efficiency of light. As a result, a luminance can be enhanced.

FIG. 5 shows a blink backlight having a reflection plate

according to the present invention in detail, in which the reflection plate 27 is turned separately from the lamp by a rotation driver 31.

Meanwhile, in another embodiment of the present invention, as shown in FIG. 6, a blink backlight 21 is realized by fixing a lamp 23a, and then by rotating a reflection plate 27 alone. At this time, a rotation speed of the reflection plate 27 is adapted to match with the scanning speed of the gate.

As mentioned above, with the backlight unit structure for the LCD in accordance with the present invention, the blink backlight having the reflection plate is applied, so that it is possible to improve a response time, to enhance an image quality of the moving picture similarly to the existing CRT, and to obtain a high luminance as well.

Although a preferred embodiment of the present invention has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.